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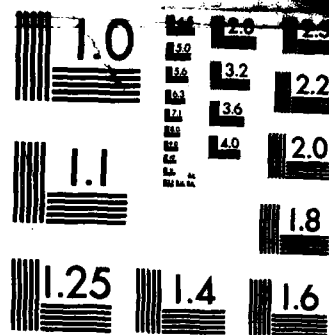
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AIR WAR COLLEGE

RESEARCH REPORT

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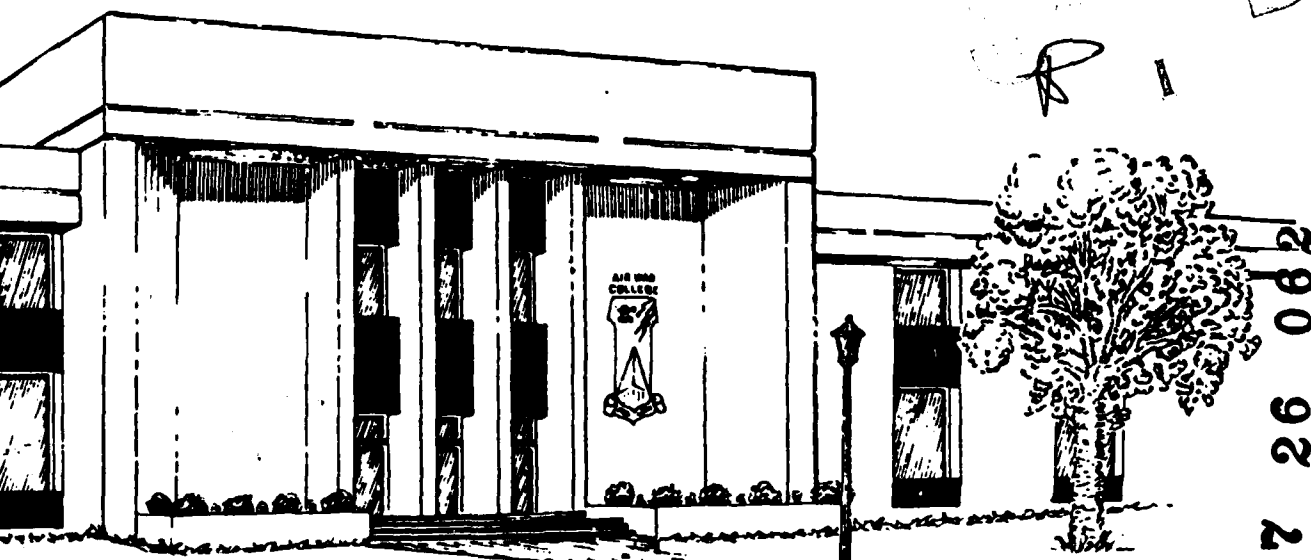
AN ANALYSIS OF THE AIR WAR COLLEGE'S EXECUTIVE
HEALTH AND FITNESS ASSESSMENT PROGRAM

By LIEUTENANT COLONEL BOBBY O. FLOYD

LIEUTENANT COLONEL L. JAY McINTYRE

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AIR WAR COLLEGE

AIR UNIVERSITY

AN ANALYSIS OF THE AIR WAR COLLEGE'S
EXECUTIVE HEALTH AND FITNESS ASSESSMENT PROGRAM

BY

LT COLONEL BOBBY O. FLOYD, USAF

LT COLONEL L. JAY McINTYRE, NEANG MC

A RESEARCH REPORT SUBMITTED TO THE FACULTY
IN FULFILLMENT OF THE RESEARCH REQUIREMENT

Research Advisor: Lieutenant Colonel Robert Fowler

MAXWELL AIR FORCE BASE, ALABAMA

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AIR WAR COLLEGE RESEARCH PROJECT ABSTRACT

TITLE: An Analysis of the Air War College's Executive Health and Fitness Assessment Program

AUTHORS: Bobby O. Floyd, Lieutenant Colonel, USAF
L. Jay McIntyre, Lieutenant Colonel, NEANG MC

An analysis of the Air War College's Executive Health and Fitness Program for the Air War College Class of 1985 is presented. Four hundred fifty-one individuals including 227 students underwent an executive health analysis. Eleven coronary risk factors were identified and measured. At least one student was found to be at very high risk in 9 of the 11 risk factors. One hundred fifty-eight students had overall low to very low total risk. Sixty-nine students (30 percent) had moderate or greater risk of developing coronary heart disease. Explanations of the risk factors and values obtained were presented in handout booklets and in lectures on cardiovascular fitness, nutrition, and stress. General prescriptions to modify risk factors were provided. Individual follow-up was available through the base hospital for those individuals requiring medical intervention. Recommendations made as a result of this research project include continued emphasis on education and student and spouse orientation, better psychometrics, improved follow-up, and earlier involvement at the SOS and ACSC levels.

BIOGRAPHICAL SKETCH

LIEUTENANT COLONEL BOBBY O. FLOYD (B.S., USAF Academy; M.A., Central Michigan University) has been a student of physical fitness since his tour in Vietnam in 1972. He graduated from the Armed Forces Staff College in 1978 and has served as a C-141 Flight Examiner Aircraft Commander and Squadron Commander, a procurement officer in the Air Force Systems Command, and as a planning and programming officer on the Air Staff. Colonel Floyd is a graduate of the Air War College, class of 1985.

BIOGRAPHICAL SKETCH

LIEUTENANT COLONEL LEONARD JAY McINTYRE (M.D., University of Nebraska, College of Medicine) has had a special interest in nutrition and physical fitness for many years. He served on active duty with the USAF from 1965 to 1970. He practiced general medicine both in the private sector and at a V.A. Medical Center in Nebraska. He joined the Nebraska Air National Guard in 1977 and has served as Chief of Flight Medicine and as Commander of the medical unit. Colonel McIntyre is a graduate of the Air War College, class of 1985.

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I. INTRODUCTION

A key benefit of the physical fitness craze that invaded our nation in the 70s was the realization that there is a direct relationship between productivity and fitness. As corporations began to look at the potential savings both in training costs to replace sick (or dead) employees and increased profits from greater productivity, their interest in the health of their employees soared. In the last five years there has been a tremendous increase in the number of corporations that have taken a keen interest in the health of their employees, especially their middle and senior management. (7:538; 10:148)

In an organization as large as the United States Air Force, where do you start? In 1983, the faculty at the Air War College determined that the Air War College's program provided an excellent opportunity for some of the key middle managers of the Air Force to take a hard look at their lifestyles and make an assessment of their current health status. Thus was born the Air War College's Executive Health and Fitness Assessment Program. The first class (Class of 1984) completed the program with remarkable results.

The second class (Class of 1985) was recently evaluated by the program. In the next few pages we will discuss the Air War College's Executive Health Assessment and Fitness Program; its objectives, methodology, and results. We will then offer some recommendations regarding possible improvements and additions to the program.

II. OBJECTIVES

The objectives of the Air War College's Health Assessment and Fitness Program were ambitious. First, the program would educate the individuals regarding the need for good health and physical fitness. The individuals would then be evaluated and provided a current assessment of their health status, specifically their cardiovascular fitness. This evaluation provided a baseline for the individuals. For those with low or average risk factors, the feedback would reinforce the adequacy of their current lifestyle. For those individuals with high risk factors, the program provided prescriptions to change their lifestyles and, hopefully, reduce the high risk factor.

A major, yet subtle, objective of the program was to provide some of the future leaders of the U.S. Air Force with a greater understanding and appreciation of the dramatic impact that an individual's lifestyle has on his health. The food we eat, our exercise program, and how we handle stress play a major role in how we perform on the job today, but could easily determine if we will be around to perform that or other jobs in the future.

III. METHODOLOGY

First, the class was briefed on the program. It was emphasized that participation in the program was strictly voluntary and that the results would be provided to the individual only. This was the beginning of the educational phase of the program. We were provided with statistics regarding the risk of heart attack for our age group, impact of diet, smoking and exercise, to mention a few—they were beginning to get our attention. Each member of the class was issued two outstanding books to read: The Aerobics Program for Total Well-Being by Dr. Kenneth H. Cooper and Executive Health by Philip Goldberg. The books reinforced what we had heard and provided more background/evidence of the need to be physically fit and gave hints on how to improve our health and fitness.

We were then asked to complete a "Personal Lifestyle Improvement Questionnaire" developed by the United States Sports Academy of Mobile, Alabama. The questionnaire began with an assessment of our goals--what did each of us expect from the program? The questionnaire then addressed the following areas: (1) Our nutrition and weight management program; (2) Tobacco, alcohol, and caffeine consumption; (3) Cardiovascular disease history; (4) General health history; (5) A self evaluation of our ability to handle stress and tension; and (6) A detailed assessment of our aerobic exercise and recreational activities.

Next, blood tests were conducted on each individual. Twenty-one items were measured. Some of the items measured were: glucose, cholesterol,

VII. SUMMARY

Four hundred fifty-one individuals including 227 AWC students underwent an executive health analysis. Eleven coronary risk factors were identified and measured. At least one student was found to be at very high risk in 9 of the 11 risk categories. One hundred fifty-eight students had overall low to very low total risk. Sixty-nine students (30 percent) had moderate or greater risk of developing coronary heart disease. Explanations of risk factors and values obtained were presented in handout booklets and in lectures on cardiovascular fitness, nutrition, and stress. General prescriptions to modify risk factors were provided. Individual follow-up was available through the base hospital for those individuals requiring medical intervention. Recommendations included continued emphasis on education and student and spouse orientation, better psychometrics, improved follow-up, and earlier involvement at the SOS and ACSC levels.

may be adequate in the AWC setting. A questionnaire identifying sources of stress, measurable estimates of response to stress, and estimating its level of contribution to risk is needed.

A meaningful follow-up program plagues many health assessment programs. With the initial health assessment early in the AWC course, a more formal voluntary follow-up assessment could be scheduled five to six months later.

The long-term nature of the development of coronary heart disease would suggest intervention at the earliest date. A risk factor orientation lecture emphasizing individual health responsibility at the SOS level and a similar lecture with a TC/HDL ratio at the ACSC level would give individuals the opportunity to identify and modify risk factors at an earlier stage, reducing the likelihood of developing coronary heart disease.

VI. RECOMMENDATIONS

The Executive Health Assessment and Fitness Program at AWC is organized to help students and their spouses become familiar with the concept of risk factors in coronary heart disease. The AWC students measure and identify risk factors and are given the opportunity to modify controllable risk factors. The program is well accepted as indicated by the high voluntary participation (96 percent).

The following recommendations are included as suggestions for strengthening the program.

1. Keep the program educational and student and spouse oriented.
2. Improve the psychological testing.
3. Develop a more structured follow-up program.
4. Expand the awareness of risk factors associated with coronary heart disease to ACSC and SOS.

The risk factors of coronary heart disease can be modified by the individual. The individual can and should take the responsibility for his or her own preventive medical care. This concept is best reinforced by keeping the health assessment program student, spouse, and education oriented. The emphasis is on identifying and estimating a measure of risk factors so the individual has the opportunity to assess his or her risk and modify the risk factors involved, if so desired.

The AWC students are concerned about stress and its effects. Friedman and his associates identify Type A individuals through a combination of questionnaires and an interview by a professional. A similar questionnaire

smoking. Follow up studies after intervention can provide reinforcement of risk factor modification. (12:377).

Risk factor modification is an individual responsibility, and because of the personal and marital relationships it is a family responsibility. (20:133) When risk factors are controlled, coronary heart disease can be significantly reduced. (9:1062) The Air Force will have an individual who will require less maintenance, will have less downtime, will produce more, and will be more ready to do his or her job.

V. COMMENT

A 42-year-old Air Force lieutenant colonel working long hours at a sedentary, moderately stressful job has a total cholesterol of 250 mg/dl (HDL of 32 mg/dl and a TC/HDL ratio of 7.8), a blood pressure of 145/92 mm Hg, and is 12 pounds overweight. His father died at age 54 of a heart attack. He has no physical complaints and has recently been to the medics for a periodic physical examination. He has no "treatable" disease or illness and may have been sent back to duty after a perfunctory "cut out the salt and get a little more exercise" prescription.

This Air Force officer has at least six significant, reducible coronary heart disease risk factors and has a two- to three-fold risk of developing coronary heart disease. Although no AWC student had all these findings, each of the measurements in this officer's history and examination represents a real AWC student value. If a risk factor of smoking were added (20 percent of the students are smokers), the cumulative risk would increase significantly. (11:1552)

By identifying and measuring coronary risk factors, an individual may get an indication of his or her likelihood of developing coronary heart disease. It is a multi-factoral disease and the risks appear to be cumulative. Evidence indicates risk factors can be reduced and modification reduces the risk of coronary heart disease. (9:1055; 23:1844) To be most effective, risk reduction should include attention to all the risk factors. (27:37) Risk reduction requires individual action, exercise, nutrition, and cessation of

This factor was rated at a maximum of 8 points for history of heart attack within the past year and 6 points for known history of coronary heart disease without heart attack or bypass surgery.

Student Spouses

Student spouses were rated in the very high risk range 86 times in 9 of the 11 risk factor categories. (See Appendices F and G.) Six student spouses were at very high risk for personal history. Twelve spouses were at very high risk for family history. Family history of heart disease is well documented. (1:9) Coronary heart disease is twice as common among first degree relatives of patients with a history of heart attack as among controls. Spouses of affected patients also have twice the risk as controls. Spouses of affected patients have been found to have several risk factors in common with affected patients, including elevated blood pressure, lipids, blood glucose, obesity, and cigarette smoking. The common risk factors were initially explained as resulting from a common marital environment. However, these risk factors did not change over a 12-year study period demonstrating men and women resembling each other in lifestyle are more likely to marry each other. (16:402)

The combination of common risk factors in spouses of individuals with increased risk as well as the importance of proper diet and cessation of smoking points to the significance of including student spouses in the health and fitness program.

Triglyceride levels can be used to help classify metabolic lipid disorders but are unnecessary for widespread screening. Triglyceride levels only become a significant risk factor in conjunction with elevated cholesterol or other risk factors.

Body Fat

Thirty-one students (14 percent) were in the moderate or greater risk range for elevated body fat. One international officer and one U.S. female were in the high risk range and two students (a U.S. male and an international officer) were in the very high risk category. Maximum risk points for body fat were 4 points at 32.5 percent for 40-year-old males and 36.5 percent for 40-year-old females. Body fat determinations were estimated from neck, waist, and hip measurements factored into total weight. (See Appendix L.) There is a strong positive relationship with increasing weight and increasing incidence of coronary heart disease. (1:8) Obesity demonstrates both an independent risk and a cumulative risk with hypertension, elevated cholesterol, and a sedentary life style.

Blood Glucose

Three students rated moderate and a single student rated high risk, blood sugars 129 mg/dl and 137 mg/dl respectively. The maximum risk factor for blood glucose was 3 points. There is a modest increase in risk at blood sugar levels near the upper limits of normal range (61-128 mg/dl). However, with blood glucose levels of 150 mg/dl or greater the risk of incidence of coronary heart disease increases significantly. (1:8)

Personal History

The AWC students achieved the lowest overall risk in this category with only two students, one U.S. male and one international officer, rated in the very high risk category. All other students were in the very low risk range.

High Blood Pressure

High blood pressure is the third major risk factor for coronary heart disease. The higher the blood pressure the greater the risk of developing coronary heart disease. This is true for both systolic and diastolic blood pressure. Risk factor points were added when blood pressures exceeded 130 mm Hg systolic and 84 mm Hg diastolic. A maximum of 4 points was added for systolic pressure greater than 155 mm Hg and 4 points for diastolic pressure greater than 105 mm Hg. Blood pressure values in this range or greater increase the risk of coronary heart disease two- to three-fold. Incidence of stroke is increased seven-fold at these levels. (1:7)

Thirty students (13 percent) had a moderate or greater systolic risk factor and 42 (18 percent) had diastolic blood pressure in the moderate or greater range. All blood pressures in this study were obtained at a single setting. Frequently, participants had been standing in line and talking with other individuals for several minutes before the blood pressures were taken. On one occasion weak batteries in the sphygmomanometer gave spurious readings. Several students reported hyperreactivity to blood pressure readings and were given second readings at the same setting. These factors may have produced some overall increase in the average blood pressures and certainly unreliably elevated blood pressures in a few students. Several students were known hypertensives on medication.

Triglycerides

Forty-five students (20 percent) had triglyceride levels in the moderate or greater risk category. Triglycerides were weighted with a maximum risk factor of 2 points. There is insufficient evidence for a cause-and-effect relationship between triglycerides and coronary heart disease. Elevated triglyceride is not considered an independent risk factor. (14:672)

nicotine cigarettes may not reduce the risk of heart disease. Smoking cigarettes appears to have a more significant effect on the occurrence of coronary artery disease in smokers younger than age 45. (6:253)

Total Cholesterol/High Density Lipoprotein

The simple total cholesterol (TC) is powerfully related to the development of coronary heart disease. Low density lipoproteins (LDL) show positive associations with subsequent rates of coronary heart disease. High density lipoprotein (HDL) show strong negative associations with coronary risk. The use of total cholesterol alone is quite unreliable in determining risk on an individual basis because of interrelationships in lipid metabolism. Studies suggest the total cholesterol:High Density Lipoprotein ratio is a satisfactory measure of the cholesterol risk factor. (1:6; 2:733; 18:73; 27:909)

The TC/HDL ratio, a major risk factor, was weighted a maximum of 10 points, very high risk at 6.6 or greater in women and 7.6 in men. Forty-five students (20 percent) rated a moderate or greater risk. The Framingham study suggests individuals with TC/HDL ratios greater than 4.5 should be further evaluated. Researchers have now demonstrated statistically significant proof that reducing total cholesterol and low density lipoproteins, thus lowering the TC/HDL ratio, lowers the risk of developing coronary artery disease. (19:368) Individuals with levels of total cholesterol less than 150 mg/dl almost never develop symptomatic coronary heart disease. The average level of total cholesterol of Americans aged 35 to 59 is 210 to 220 mg/dl. (17:63) The average total cholesterol level of American male victims of first-time heart attacks is about 225 mg/dl. (24:469) The average AWC student's total cholesterol level was 199 mg/dl and 89 students (39 percent) had TC/HDL ratios greater than 4.5 indicating an area of needed risk reduction.

exercise, planned leisure time, proper nutrition, and avoiding abuse of tobacco, alcohol, coffee, and other drugs.

Family History

The fourth most commonly occurring risk factor was family history. Eighty-nine students (39 percent) had moderate or greater risk due to family history. Fourteen had a very high risk factor. Family history was rated a maximum of 4 points for history of an immediate family member experiencing a heart attack under 50 years of age. Studies show persons whose father died prior to age 60 have double the rate of coronary heart disease. (1:9) An individual cannot change his family history, but the cumulative nature of risk factors increases the importance of identifying each risk factor.

Smoking

Cigarette smoking is one of the three major risk factors that relate to the development of coronary heart disease. Fifty-five students (24 percent) were at moderate or greater risk due to smoking. A smoking habit of 40 cigarettes or more per day was weighted 8 points. A moderate risk of 4 points was given for one-half pack of cigarettes per day. Cooper weights 40 cigarettes per day 6 points and 1-10 cigarettes per day 2 points. Smokers tend to underestimate their smoking habit by about one-half pack per day.

Numerous studies reveal increased risk of developing coronary artery disease as compared to non-smokers. (4:1558;28:798) Smokers also appear to have increased risk of sudden death. Cessation of smoking will significantly reduce the risk after one year with continued risk reduction over the following five or more years. (21:1473)

Recent studies indicate the development of coronary heart disease in cigarette smokers may be independent of the nicotine levels and carbon dioxide levels of cigarettes. Reducing nicotine in cigarettes or switching to low

individuals who exercise regularly fare better in any measure of cardiovascular disease than sedentary individuals with no exercise program.

Stress

Stress risk factor values were estimated by using a questionnaire. The students rated self estimates of feelings of stress or tension. Use of sedative medication or tranquilizers, feelings of irritability and fatigue, and a Holmes and Rahe's "life events" list were included in the questionnaire. (13:215) A Type A/Type B behavior scale was used to estimate Type A behavior. Cooper rates maximum stress at 3 points. The stress risk factor in this program was weighted a maximum of 4 points for extreme tension. Ninety-nine (44 percent) of the students rated a moderate or greater risk due to stress.

There is no longer any doubt that a relationship exists between personality, stress, and disease. (26:231) The Framingham study identifies a white collar, bossy, time urgent, rapid eating, impatient male as a Type A and notes a doubling of risk. A similar pattern was noted in females. (1:9) The difficulty with the stress risk factor is measuring or quantifying the stress and determining how significant it is as a risk factor in a specific individual. Friedman identifies the stress risk factor in terms of personality and identifies those individuals at risk by questionnaires completed by the individual, his or her spouse, and a colleague at work. A second measure is completed by a professional interviewer. (8:239) Others separate Type As into two groups, one at risk for developing heart disease and the other with typical Type A behavior, but with apparent low coronary risk. (5:50)

The prescription for stress reduction regardless of type or source includes improved time management, relaxation response activities, regular

Age

The average age of the AWC students was 41.4 years. One hundred sixty-nine students were in the moderate risk category. Four students were over 50 years of age, placing them in the high risk category for age. Age risk is considered cumulative. The coronary risk factors occurring in an older individual increase the risk of developing coronary heart disease.

Cardiovascular Fitness

The next most frequent risk factor was cardiovascular fitness, or more specifically, lack of cardiovascular fitness. Cardiovascular fitness was weighted a maximum of six points for the poorest fitness levels. Fitness levels were estimated from a combination of student questionnaire answers on the amount of regular exercise and a measured "resting" heart rate. The estimates of the students' levels of cardiovascular fitness were the least accurately measured of the risk factors. One hundred twenty students (53 percent) were rated at moderate or greater risk due to lack of cardiovascular fitness. Nineteen students (8 percent) were placed in the very high risk category.

A sedentary life style has long been associated with increased mortality rates. (25:157) There has been a reluctance, however, to infer that exercise might extend survival. Recent studies indicate reduced mortality rates in middle aged men who exercise regularly. (22:494) Physical fitness can be modified and has direct positive influence on reducing the desire to smoke, reducing obesity, helping to control blood pressure, and countering psychological stresses. Vigorous exercise producing a sustained heart rate of 70-80 percent of maximum heart rate for 30 minutes at least 3 times a week is currently considered a minimum for cardiovascular fitness.(3:134) Those

IV. DISCUSSION

Four hundred fifty-one individuals participated in the Air War College (AWC) Class of 1985 Executive Health and Fitness Program. (See Appendix A.) The 227 AWC students included 3 U.S. females and 32 male international officers. There were 44 faculty, 129 U.S. student wives, 24 international student wives, and 27 faculty wives who also participated. (See Appendices B-K.) Three hundred thirteen participants were rated in the very low to low coronary heart disease risk category. These individuals achieved an average total score of 12.9 or less on a scale of risk from very low, 0 to 4.9 points to very high, 31 or more points.

The profile of the 227 AWC students reveals an average 41.4-year-old, with a total cholesterol:high density lipoprotein ratio of 4.2, a blood pressure of 121/82 mm Hg, and a body fat of 18.9 percent. The most frequently occurring moderate or greater risk factors were age, cardiovascular fitness, stress, and family history. The second most commonly occurring risk factors were smoking, elevated total cholesterol, high density lipoprotein ratios, hypertension, and elevated triglycerides. Elevated body fat, high blood glucose levels, and personal history of heart disease were the least common risk factors present.

The risk factors were weighted on a scale based on the Framingham study, Dr. Kenneth H. Cooper's studies in aerobics (3:277), and slight modifications by data collected at a sports medicine facility used in conducting the study.

(15:1)

triglycerides, sodium, potassium, etc. Blood pressure, heart rate, age, and body fat were also documented.

The individual data mentioned above were forwarded to the United States Sports Academy at Mobile for the final process in the evaluation phase. The data were evaluated by personnel at the Sports Academy and individual cardiovascular risk sheets were prepared.

Approximately one month later, representatives from the Sports Academy presented four hours of lectures regarding the specific risk factors--which items we can or cannot change--and some statistics regarding same. It was no accident that the individual risk factors assessment sheet had been returned to each individual approximately one hour prior to the beginning of the briefings by the Sports Academy personnel. Obviously, they had the audience's attention--a dramatic step in the education process. The program didn't stop here. Individuals with problems were made aware of who they could see, but, again, on a voluntary basis.

There are currently 240 students in the Air War College Class of 1985; 197 are U.S. military students (167 Air Force, 19 Army, 5 Navy, 5 Marines, and 1 Coast Guard). Thirty-five international students are in the class. There are 8 civilian students. Of the total of 240 students, 227 participated in the program--a remarkable 96 percent. Now, let's look at the cardiovascular risk factors and how the participants measured up.

APPENDICES

APPENDIX A

CARDIOVASCULAR RISK FACTOR REPORT

ALL PARTICIPANTS (451)

RISK FACTORS	TEST RESULTS	RISK CATEGORY					VERY	RISK PTS (MEDIAN)
	MEDIAN/MEAN	VERY	LOW	LOW	MOD	HIGH	HIGH	
1. TOTAL CHOL	187/193							
2. CHOL RATIO	3.9/3.9	293	86	41	18	13		0.4
3. TRIGLYCERIDES	85/89	301	89	36	16	9		0.0
4. GLUCOSE	101/102	422	22	4	1	2		0.0
5. SYSTOLIC PRES	117/119	312	84	36	14	5		0.0
6. DIASTOLIC PRES	79/80	253	132	50	12	4		0.0
7. BODY FAT	21.1/22.0	109	207	89	25	21		0.8
8. AGE FACTOR	42.0/41.1	2	145	288	14	2		2.2
9. FAMILY HISTORY	2/2.1	267	2	149	3	30		1.8
10. PERSONAL HIST	1/1.1	438	1	1	1	10		0.4
11. CARDIO FIT	40/39.3	33	140	106	71	71		2.0
12. SMOKING	1.7/2.6	328	23	35	43	22		2.1
13. STRESS	2/2.3	56	222	149	20	4		2.1
TOTAL RISK	10.3/11.1	27	286	125	12	1		

APPENDIX B

CARDIOVASCULAR RISK FACTOR REPORT

ALL STUDENTS (227)

<u>RISK FACTORS</u>	<u>TEST RESULTS</u>	<u>RISK CATEGORY</u>					<u>VERY</u>	<u>RISK PTS</u>
	<u>MEDIAN/MEAN</u>	<u>VERY</u>	<u>LOW</u>	<u>LOW</u>	<u>MOD</u>	<u>HIGH</u>	<u>HIGH</u>	<u>(MEDIAN)</u>
1. TOTAL CHOL	197/199							
2. CHOL RATIO	4.2/4.2	143	39	26	11	8		0.0
3. TRIGLYCERIDES	92/95	133	49	26	13	6		0.0
4. GLUCOSE	102/103	211	12	3	1	0		0.0
5. SYSTOLIC PRES	118/121	142	55	16	10	4		0.0
6. DIASTOLIC PRES	80.5/81.5	110	75	33	8	1		0.1
7. BODY FAT	18.5/18.9	72	124	25	3	3		0.3
8. AGE FACTOR	41.4/41.4	0	54	169	4	0		2.1
9. FAMILY HISTORY	1.9/2.1	137	1	73	2	14		1.1
10. PERSONAL HIST	1/1	225	0	0	0	2		0.2
11. CARDIO FTT	44/43	23	84	72	29	19		1.8
12. SMOKING	1.7/2.7	161	11	21	22	12		2.2
13. STRESS	2/2.3	22	106	86	12	1		2.1
TOTAL RISK	10.4/11.0	16	142	63	5	1		

APPENDIX C

CARDIOVASCULAR RISK FACTOR REPORT

U.S. STUDENTS-MALE (192)

RISK FACTORS	TEST RESULTS	RISK CATEGORY					RISK PTS (MEDIAN)
	MEDIAN/MEAN	VERY LOW	LOW	MOD	HIGH	VERY HIGH	
1. TOTAL CHOL	197/198						
2. CHOL RATIO	4.1/4.1	126	32	22	6	6	0.0
3. TRIGLYCERIDES	90/90	114	43	21	22	3	0.0
4. GLUCOSE	103/103	181	9	2	0	0	0.0
5. SYSTOLIC PRES	120/122	116	50	15	8	3	0.0
6. DIASTOLIC PRES	81/81	92	66	26	7	1	0.1
7. BODY FAT	18.3/18.4	67	106	16	2	1	0.6
8. AGE FACTOR	41.0/41.3	0	43	146	3	0	2.1
9. FAMILY HISTORY	2/2.1	114	1	63	2	12	1.2
10. PERSONAL HIST	1/1	191	0	0	0	1	0.1
11. CARDIO FIT	45/43.6	17	77	62	23	13	1.8
12. SMOKING	2/2.8	133	10	19	18	12	1.8
13. STRESS	2/2.3	16	91	74	1	1	2.2
TOTAL RISK	9.8/10.6	15	121	52	4	0	

APPENDIX D

CARDIOVASCULAR RISK FACTOR REPORT

U.S. STUDENTS-FEMALE (3)

RISK FACTORS	TEST RESULTS MEDIAN/MEAN	RISK CATEGORY					VERY HIGH	RISK PTS (MEDIAN)
		VERY	LOW	LOW	MOD	HIGH		
1. TOTAL CHOL	137/211							
2. CHOL FATIO	2.8/2.9	2	1					0.0
3. TRIGLYCERIDES	37/55	3						0.0
4. GLUCOSE	97/97	3						0.0
5. SYSTOLIC PRES	118/121	2				1		0.0
6. DIASTOLIC PRES	79/82	2			1			0.0
7. BODY FAT	26.0/26.		1	1	1			1.2
8. AGE FACTOR	37/42		2	1				1.7
9. FAMILY HISTORY	3/2.3	1		2				1.2
10. PERSONAL HIST	1/1	3						0.0
11. CARDIO FIT	36/		1	1		1		2.6
12. SMOKING	1/1.3	3						0.0
13. STRESS	2/2		3					1.2
TOTAL RISK	11.1/10.5		3					

APPENDIX E

CARDIOVASCULAR RISK FACTOR REPORT

INTERNATIONAL OFFICERS (32)

<u>RISK FACTORS</u>	<u>TEST RESULTS</u> <u>MEDIAN/MEAN</u>	<u>RISK CATEGORY</u>					<u>VERY</u> <u>HIGH</u>	<u>RISK PTS</u> <u>(MEDIAN)</u>
		<u>VERY</u>	<u>LOW</u>	<u>LOW</u>	<u>MOD</u>	<u>HIGH</u>		
1. TOTAL CHOL	200/202							
2. CHOL RATIO	4.9/5.2	15	6	4	5	2		0.8
3. TRIGLYCERIDES	101/126	16	6	5	2	3		0.1
4. GLUCOSE	102/105	27	3	1	1	0		0.0
5. SYSTOLIC PRES	114/118	24	5	1	1	1		0.0
6. DIASTOLIC PRES	80/82	16	9	6	1	0		0.0
7. BODY FAT	19.9/20.8	5	17	8	1	1		0.8
8. AGE FACTOR	41.6/41.6	0	9	22	1	0		2.2
9. FAMILY HISTORY	1/1.8	22	0	8	0	2		0.7
10. PERSONAL HIST	1/1	31	0	0	0	1		0.1
11. CARDIO FIT	41/41	3	7	10	6	6		2.0
12. SMOKING	1/2.2	25	1	2	4	0		1.4
13. STRESS	2/2.4	6	12	12	2	0		3.1
 TOTAL RISK	 11.2/12.9	 1	 18	 11	 1	 1		

APPENDIX F

CARDIOVASCULAR RISK FACTOR REPORT

U.S. STUDENTS' WIVES (129)

RISK FACTORS	TEST RESULTS MEDIAN/MEAN	RISK CATEGORY					VERY HIGH	RISK PTS (MEDIAN)
		VERY LOW	LOW	MOD	HIGH			
1. TOTAL CHOL	177/182							
2. CHOL RATIO	3.1/3.3	92	27	7	2	1		0.0
3. TRIGLYCERIDES	69/74	108	17	3	1	0		0.0
4. GLUCOSE	98/100	124	4	0	0	1		0.0
5. SYSTOLIC PRES	113/115	97	18	10	3	1		0.0
6. DIASTOLIC PRES	77/77	87	28	11	2	1		0.0
7. BODY FAT	25.2/26.1	20	44	45	13	7		1.2
8. AGE FACTOR	39.1/39.1	1	71	57	0	0		1.9
9. FAMILY HISTORY	2/2	69	1	6	1	12		1.8
10. PERSONAL HIST	1/1	121	1	0	1	6		0.4
11. CARDIO FIT	35/34	3	25	45	25	31		2.4
12. SMOKING	1/2.5	100	7	2	15	5		2.4
13. STRESS	2/2.2	15	65	42	6	1		1.4
TOTAL RISK	10.6/11.3	5	85	35	4	0		

APPENDIX G

CARDIOVASCULAR RISK FACTOR REPORT

INTERNATIONAL STUDENTS' WIVES (24)

<u>RISK FACTORS</u>	<u>TEST RESULTS</u> <u>MEDIAN/MEAN</u>	<u>RISK CATEGORY</u>					<u>RISK PTS</u> <u>(MEDIAN)</u>
		<u>VERY</u>	<u>LOW</u>	<u>LOW</u>	<u>MOD</u>	<u>HIGH</u>	
1. TOTAL CHOL	175/180						
2. CHOL RATIO	3.3/3.7	14	5	4	1	0	0.0
3. TRIGLYCERIDES	78/95	15	6	1	0	2	0.0
4. GLUCOSE	101/101	22	2	0	0	0	0.0
5. SYSTOLIC PRES	112/111	20	3	1	0	0	0.0
6. DIASTOLIC PRES	76/77	15	9	0	0	0	0.0
7. BODY FAT	26.4/27.8	1	3	7	5	8	2.0
8. AGE FACTOR	37.9/37.9	1	14	9	0	0	1.8
9. FAMILY HISTORY	2/1.8	18	0	6	0	0	0.2
10. PERSONAL HIST	1/1	23	0	0	0	1	0.0
11. CARDIO FIT	33/33	1	5	7	4	7	2.1
12. SMOKING	1/2.3	18	2	1	2	1	1.0
13. STRESS	2/2.4	4	12	7	0	1	2.0
 TOTAL RISK	 10.7/11.5	 0	 15	 9	 0	 0	

APPENDIX H
CARDIOVASCULAR RISK FACTOR REPORT

FACULTY (44)

<u>RISK FACTORS</u>	<u>TEST RESULTS</u> <u>MEDIAN/MEAN</u>	<u>RISK CATEGORY</u>					<u>RISK PTS</u> <u>(MEDIAN)</u>
		<u>VERY</u>	<u>LOW</u>	<u>LOW</u>	<u>MOD</u>	<u>HIGH</u>	
1. TOTAL CHOL	186/197						
2. CHOL RATIO	4.5/4.6	23	13	3	1	4	0.0
3. TRIGLYCERIDES	88/104	25	11	5	2	1	0.0
4. GLUCOSE	104/106	38	4	1	0	1	0.0
5. SYSTOLIC PRES	122/120	32	6	6	0	0	0.0
6. DIASTOLIC PRES	78/81	24	13	5	1	1	0.0
7. BODY FAT	19.0/19.4	10	28	6	0	0	0.8
8. AGE FACTOR	45.6/45.6	0	2	35	6	1	2.6
9. FAMILY HISTORY	2/2.2	27	0	14	0	3	1.2
10. PERSONAL HIST	1/1	42	0	1	0	1	0.5
11. CARDIO FIT	42/41.4	4	17	7	9	7	0.8
12. SMOKING	2/2.7	28	2	9	2	3	1.4
13. STRESS	2/2.1	9	26	7	2	0	2.4
TOTAL RISK	9.7/11.0	3	28	12	1	0	

APPENDIX I

CARDIOVASCULAR RISK FACTOR REPORT

FACULTY WIVES (27)

RISK FACTORS	TEST RESULTS	RISK CATEGORY					VERY	RISK PTS
	MEDIAN/MEAN	VERY	LOW	LOW	MOD	HIGH	HIGH	(MEDIAN)
1. TOTAL CHOL	185/187							
2. CHOL RATIO	2.9/3.3	21	2	1	3	0		0.0
3. TRIGLYCERIDES	75/84	20	6	1	0	0		0.0
4. GLUCOSE	103/101	27	0	0	0	0		0.0
5. SYSTOLIC PRES	112/116	21	2	3	1	0		0.0
6. DIASTOLIC PRES	78/81	17	7	1	1	1		0.0
7. BODY FAT	26.1/28.0	6	8	6	4	3		1.1
8. AGE FACTOR	44.1/44.1	0	4	18	4	1		2.4
9. FAMILY HISTORY	2/2.2	16	0	10	0	1		0.5
10. PERSONAL HIST	1/1	27	0	0	0	0		0.0
11. CARDIO FTT	32/33	2	9	5	4	7		1.9
12. SMOKING	2/2.6	21	1	2	2	1		1.4
13. STRESS	2/2.2	6	13	7	0	1		1.8
TOTAL RISK	9.1/10.9	3	16	6	2	0		

APPENDIX J

CARDIOVASCULAR RISK FACTOR REPORT

ALL STUDENTS & FACULTY (271)

<u>RISK FACTORS</u>	<u>TEST RESULTS</u> <u>MEDIAN/MEAN</u>	<u>RISK CATEGORY</u>					<u>RISK PTS</u> <u>(MEDIAN)</u>
		<u>VERY</u>	<u>LOW</u>	<u>LOW</u>	<u>MOD</u>	<u>HIGH</u>	
1. TOTAL CHOL	195/199						
2. CHOL RATIO	4.3/4.3	166	52	29	12	12	0.0
3. TRIGLYCERIDES	91/96.1	158	60	31	15	7	0.0
4. GLUCOSE	103/10	249	16	4	1	1	0.0
5. SYSTOLIC PRES	119/1	174	61	22	10	4	0.0
6. DIASTOLIC PRES	80/81	134	88	38	9	2	0.0
7. BODY FAT	18.7/19.0	82	152	31	3	3	0.4
8. AGE FACTOR	43.1/42.1	0	56	204	10	1	2.3
9. FAMILY HISTORY	2/2.1	164	1	87	2	17	1.2
10. PERSONAL HIST	1/1	267	0	1	0	3	1.1
11. CARDIO FIT	43/43	27	101	79	38	26	1.9
12. SMOKING	1.9/2.7	189	13	30	24	15	2.3
13. STRESS	2/2.3	31	132	93	14	1	2.1
TOTAL RISK	10.2/11.0	19	170	75	6	1	

APPENDIX K

CARDIOVASCULAR RISK FACTOR REPORT

ALL FEMALE PARTICIPANTS (183)

<u>RISK FACTORS</u>	<u>TEST RESULTS</u> <u>MEDIAN/MEAN</u>	<u>RISK CATEGORY</u>					<u>RISK PTS</u> <u>(MEDIAN)</u>
		<u>VERY</u>	<u>LOW</u>	<u>LOW</u>	<u>MOD</u>	<u>HIGH</u>	<u>VERY</u> <u>HIGH</u>
1. TOTAL CHOL	178/183						
2. CHOL RATIO	3.1/3.3	129	35	12	6	1	0.0
3. TRIGLYCERIDES	70/78	146	29	5	1	2	0.0
4. GLUCOSE	99/100	176	6	0	0	1	0.0
5. SYSTOLIC PRES	113/115	140	23	14	5	1	0.0
6. DIASTOLIC PRES	77/78	121	44	13	3	2	0.0
7. BODY FAT	25.5/26.7	27	56	59	22	19	1.3
8. AGE FACTOR	39.3/39.8	2	91	85	4	1	1.9
9. FAMILY HISTORY	2/2.2	104	1	64	1	13	1.8
10. PERSONAL HIST	1/1.1	174	1	0	1	7	0.2
11. CARDIO FIT	34/34	6	40	58	33	46	2.2
12. SMOKING	1.2/2.4	142	10	5	19	7	1.9
13. STRESS	2/2.1	25	93	56	6	3	2.1
TOTAL RISK	10.5/11.3	8	119	50	6	0	

APPENDIX L

PREDICTION OF BODY FAT FROM CIRCUMFERENCE AND HEIGHT MEASUREMENTS

(All measurements are to be in inches.)

MALES:

$$\begin{aligned} \% \text{ FAT} &= 85.19545 \times \text{LOG (ABDOMEN CIRCUMFERENCE - NECK CIRCUMFERENCE)} \\ &\quad - 0.4335244 \times \text{(HEIGHT)} \\ &\quad - 61.00293 \end{aligned}$$

[CONFIDENCE LEVEL = .81; STANDARD ERROR = 3.52% FAT]

FEMALES:

$$\begin{aligned} \% \text{ FAT} &= 161.27327 \times \text{LOG (ABDOMEN + HIP - NECK CIRCUMFERENCE)} \\ &\quad - 100.81032 \times \text{LOG (HEIGHT)} \\ &\quad - 69.55016 \end{aligned}$$

[CONFIDENCE LEVEL = .72; STANDARD ERROR = 3.64% FAT]

COMMON LOGARITHMS

(To be used with above calculations)

NO.	LOG	NO.	LOG	NO.	LOG	NO.	LOG	NO.	LOG
10	1.0	27	1.4314	44	1.6435	61	1.7853	78	1.8921
11	1.0414	28	1.4472	45	1.6532	62	1.7924	79	1.8976
12	1.0792	29	1.4624	46	1.6628	63	1.7993	80	1.9031
13	1.1139	30	1.4771	47	1.6721	64	1.8062		
14	1.1461	31	1.4914	48	1.6812	65	1.8129		
15	1.1761	32	1.5051	49	1.6902	66	1.8195		
16	1.2041	33	1.5185	50	1.6990	67	1.8261		
17	1.2304	34	1.5315	51	1.7076	68	1.8325		
18	1.2553	35	1.5441	52	1.7160	69	1.8388		
19	1.2788	36	1.5563	53	1.7243	70	1.8451		
20	1.3010	37	1.5682	54	1.7324	71	1.8513		
21	1.3222	38	1.5798	55	1.7404	72	1.8573		
22	1.3424	39	1.5911	56	1.7482	73	1.8633		
23	1.3617	40	1.6021	57	1.7559	74	1.8692		
24	1.3802	41	1.6128	58	1.7634	75	1.8751		
25	1.3979	42	1.6232	59	1.7709	76	1.8808		
26	1.4150	43	1.6335	60	1.7782	77	1.8865		

(SOURCE: Naval Health Research Center, San Diego, California)

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